Astrobiology

Current, Evolving and Emerging Perspectives

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Preface

We live in an exciting era of scientific exploration. The upcoming wave of new space missions is strongly focused on the exploration of Mars (with planned sample-return) and the study of the oceans in the icy moons of Jupiter and Saturn. Since its dawn, Humankind has often wondered whether we are alone in the Universe. In the next few years, research in the booming field of Astrobiology will bring us closer than ever to finally getting an answer.

Astrobiology combines approaches from Biology, Geology, Chemistry, and Planetary Sciences to study the origin and development of Life in the universe, and search for extinct and currently existing organisms in other worlds. Research in Astrobiology is heavily anchored on the study of microbes from terrestrial analogue sites. Gaining new insights into how life copes with such extreme conditions or whether such extremophiles can survive under extraterrestrial conditions is vital for future missions.

The last decades have brought remarkable scientific advances and have shattered our long-standing misconceptions about Life's diversity and resilience. As a result of the introduction, and increased use and sophistication of molecular-based approaches, we have now realized that microbial life thrives under several of the most extreme conditions present on Earth, many of which previously thought to be anathema to Life. The physical-chemical similarities shared between some of these sites and other parts of our Solar System has brought new hope to the possible existence of Life on Mars or in the oceans of several icy moons of the outer Solar System (namely Europa and Enceladus). Microbes are now known to survive exposure to space travel, and even impact events.

The pervasiveness and new-found resilience of microbes raise some unexpected challenges. They can pose serious contamination risks associated with space missions, which might compromise results of experiments looking for the detection of organic matter and biosignatures-evidence of present or past life in other worlds. In a more extreme scenario, transport of microbial hitchhikers and contamination of other worlds could lead to the collapse of entire ecosystems before we even know that they exist.

This book combines the views of several leading experts across the globe and provides a current overview of this exciting cross-disciplinary research field. Its publication is rather timely, given the increased visibility and relevance of this area, and the upcoming wave of challenges and opportunities resulting from the new age of exploration of our Solar System.

I would like to take this opportunity to acknowledge Hugh Griffin, from Caister Academic Press, not only for challenging me to edit this book but also for his helpful support throughout the whole process. I thank all authors and reviewers for their availability to contribute to this process and for working together to producing such a remarkable book. Finally, I would also like to thank my family for their undying encouragement throughout the years, and my beloved wife Marta for her unwavering support and help in putting this project together.

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